The Ecology of the Corncrake with special reference to the effect of mowing on breeding *

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Aims

The main aim of this thesis is to examine the effect that change in the manner of harvesting grassland has on corncrake production.

Examination of available literature (chapter 1) has shown that corncrake numbers and range have declined significantly, in Europe, in the last 100 years. Over the same period there have been marked changes in grassland management, particularly involving increased mechanisation of harvesting. It has been supposed that the ecology of the corncrake makes it vulnerable to changes in grassland harvesting. Quantification of the effects has been hampered by a lack of detailed knowledge of the corncrake breeding ecology and a lack of objective information about changes in farming.

In chapter 2, information gathered by use of radio telemetry was used to demonstrate habitat preferences of corncrakes. It was found that tall growing herbs were of particular importance both early in the breeding season, and also at the end of the season when meadows had been mowed. While vegetation height was the primary factor determining use by corncrakes, the density of the vegetation was also important. Nesting and foraging habitats were largely similar, but Iris (an important foraging habitat) was rarely selected for nesting.

Radio tracking provided most of the information for a model of corncrake breeding developed in chapter 3. Breeding parameters were estimated from data gathered in Scotland and Ireland. It was important that the timing of breeding was accurately estimated to allow calculation of the potential effects on production of grassland harvesting. It was found that corncrake females usually produced two broods, but used a shortened chick care period to acheive this. Male corncrakes were found to take no part in incubation or brood rearing.

Agricultural statistics from the Irish republic were used in chapter 4 to investigate the link between declines in corncrake range and numbers and changes in agriculture. It was found that changes in numbers of machinery and livestock were correlated with declines in corncrake distribution between 1968-72 and 1988.

In chapter 5, an investigation of the reaction of corncrakes to mowing was made. Corncrake chicks are vulnerable to mowing as they are reluctant to cross open ground to reach safety. This leads to broods being killed in fields that are mowed from the outside inwards. Conservation schemes have promoted mowing from the inside outwards - a method which allows chicks to escape while still in cover of uncut grass. This study showed that a higher proportion of chicks survive in fields mowed from the inside-out.

The model of timing of breeding, the information on habitat selection and the results of the work on the reaction of corncrakes to mowing was used, in chapter 6, to show how grassland mowing affects corncrake production.

The output of the model was used to calculate expected population multiplication rates for areas of Ireland and Scotland that were surveyed for corncrakes in 1988 and 1993. It was found that the population multiplication rates in Ireland and Scotland could be largely explained by differences in corncrake production expected from average mowing dates of those regions.

* PhD thesis, University of Ireland/University College Cork (1996)

Chapter 1: Literature review

Published literature has been reviewed to establish the level of knowledge of corncrake ecology before the present study.

Three radio-tagging studies have been completed (SCHÄFFER & MÜNCH 1993, STOWE & HUDSON 1991, GRABOVSKY 1993), two of which only presented data on males. Some, previously unpublished, data from the third study, in the Uists, Scotland (STOWE & HUDSON 1991) have been combined with those from the present study.

Important studies of the distribution, habitats and causes of the decline of corncrakes in Britain and Ireland have been published by NORRIS (1945, 1947), CADBURY (1980), STOWE et al. (1993), GREEN & STOWE (1993), SHEPPARD & GREEN (1995) and GREEN (1995).

Areas where the present study will improve understanding of corncrake ecology and conservation are indicated. The most important of these is in the construction of a model of corncrake breeding based on information gathered from radio tracking and field observation. This model will enable the effects of habitat management on corncrake production to be estimated.

Chapter 2: Ranging behaviour and habitat selection by corncrakes in Ireland and Scotland

Previous attempts to estimate home range sizes of corncrakes have found that the area occupied tends to increase with the number of locations included in the calculation of the range. In the present study this problem was overcome by modelling the rate of change of the area and the number of locations used to calculate it as an asymptotic curve.

Male home ranges were found to be generally larger than those of females. This was partly because during incubation and brood rearing periods female home ranges were very small. Some males used more than one home range during the breeding season.

Corncrakes require tall vegetation at all times, in which they are usually concealed. Meadows were avoided when short (below 200 mm tall). Some vegetation types which were tall early in the season, such as Iris and nettles (*Urtica*), were strongly preferred throughout the breeding season, whereas others such as rough grass and sedges (*Carex*) were not. The density of the vegetation appeared to be, in part at least, responsible for this difference in microhabitat use.

Conservation of corncrakes would be aided by provision of more of the suitable tall growing vegetation types, but differences in feeding habitat and nesting habitat selection needs to be considered.

Chapter 3: The timing of breeding of Corncrakes Crex crex

Exact data on the timing and success of corncrake breeding are not available. A realistic model of corncrake productivity would be a valuable tool in understanding both the ecology of the species and attempting its conservation, because the effects of mowing on productivity could thereby be quantified.

Data from radio-tagged corncrakes in the Shannon Callows, Ireland and on the Isle of Coll, Scotland, were combined with unpublished data from the Uists, Scotland, to obtain estimates of important parameters of the corncrake breeding cycle required for simulation modelling of productivity.

Chapter 4: The decline of the corncrake in Ireland in relation to agricultural change

Corncrake declines in western Europe have often been linked to agricultural changes, but, at most, only anecdotal evidence has been provided to support such statements (NORRIS 1945,1947, HAARTMAN 1958). More recent studies have shown that habitat changes which could be associated with agricultural change can be used to explain corncrake distribution (STOWE et al. 1993, GREEN & STOWE 1993, GREEN in press).

One of the main problems facing studies at-

tempting to compare corncrake declines with agricultural change is that in many countries the declines occurred before comprehensive agricultural statistics were gathered. The relatively recent, and well documented, decline of corncrakes in the Republic of Ireland, and the high quality of agricultural statistics gathered by government departments over most of the period of decline, provide an opportunity to test the hypothesis linking the two.

In this chapter declines in corncrake range between 1968-72 and 1988 and declines in corncrake numbers between 1988 and 1993 are compared with changes in agriculture in Ireland over similar periods.

While general topographical and climatic effects did influence the suitability of areas for corncrakes, changes in numbers of machinery (especially tractors) and of livestock (especially dairy cattle) were found to be correlated with declines in corncrakes.

Chapter 5: The behaviour of corncrakes during mowing

The number of deaths of corncrake chicks in fields during mowing appears to have a significant effect on corncrake productivity (see chapter 6). It is supposed that corncrakes (especially flightless young) become trapped in the central, unmowed part of meadows because the pattern of mowing is usually from the outside inwards (STOWE & HUDSON 1991, WILLIAMS et al. 1991). Conservation schemes often involve changing the mowing pattern to an inside-out method.

By observation of fields during mowing, and by simulation experiments on radio-tagged corncrakes, data were collected to demonstrate the behaviour of corncrakes toward mowing activity.

Adults were rarely killed by mowing, and were found to be able to escape by moving away from mowing activity. Chicks also attempted to move away from mowing actvity but their vulnerability when crossing open (already mowed) ground meant that by using inside-out mowing methods casualties could be decreased. The distance and rate of movement by chicks increased with age.

Chapter 6: A simulation model of the influence of mowing on corncrake breeding success

Attempts to conserve corncrakes by improving breeding success have been hampered by a lack of detailed knowledge of breeding parameters and the likely effects of different mowing regimes. In this chapter, the breeding model developed in chapter 3 is used to show the effects on corncrake production of different mowing dates and different methods of mowing.

The influence of mowing date was much greater than the pattern of mowing. Corncrake production was highest when mowing was late in the breeding season and occurred rapidly.

For any of the tested range of mowing dates, the productivity of corncrakes was improved if mowing was changed from outside inwards to inside outwards, although differences were generally small.

The effect of increasing areas of habitat suitable for corncrakes, but which were not harvested by mowing would also be expected to improve breeding productivity.

Multiplication rates of corncrake populations between 1988 and 1993 were compared with those produced by the breeding model (using mowing dates collected from those areas). The result indicated that the expected level of breeding productivity alone could produce population changes similar to those actually observed.

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References

CADBURY, C. J. (1980): The status and habitats of the Corncrake in Britain 1978-79. - Bird Study

27: 203-218.

GRABOVSKY, V. I. (1993): Spatial distribution and spacing behaviour of males in a Russian corncrake (Crex crex) population. - Gibier Faune Sauvage **10**: 259-279.

Green (in Press): xxx???

GREEN, R. E. (1995): The decline of the corncrake Crex crex in Britain continues. - Bird Study **42**: 66-76.

GREEN, R. E. & STOWE, T. J. (1993): The decline of the Corncrake Crex crex in Britain and Ireland in relation to habitat change. - Journal of Applied Ecology **30**: 689-695.

HAARTMAN, L. v. (1958): The decrease of the corncrake Crex crex. - Soc. Sci. Fenn. Comment Biol. **18** (2): 1-29.

NORRIS, C. A. (1945): Summary of a report on the distribution and status of the Corncrake. - British Birds 38: 142-148, 162-168.

NORRIS, C. A. (1947): Report on the distribution and status of the Corncrake. - British Birds **40**: 226-244.

SCHÄFFER, N. & MÜNCH, S. (1993): Untersuchungen zur Habitatwahl und Brutbiologie des Wachtelkönigs Crex crex im Murnauer Moos/ Oberbayern. - Vogelwelt **114**: 55-72.

STOWE, T. J. & HUDSON, A. V. (1991): Radio telemetry studies of Corncrake in Great Britain. - Vogelwelt **112**: 10-16.

STOWE, T. J.; NEWTON, A. V.; GREEN, R. E. & MAYES, E. (1993): The decline of the Corncrake Crex crex in Britain and Ireland in relation to habitat. - Journal of Applied Ecology **30**: 53-62.

WILLIAMS, G. M.; STOWE, T. J. & NEWTON, A. V. (1991): Action for Corncrakes. - RSPB Conservation Review **5**: 47-53.